



Natural Heritage & Endangered Species Program

Massachusetts Division of Fisheries & Wildlife

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Description: Freshwater tidal marshes occur along free-flowing coastal rivers, and are influenced twice daily by the incoming tides. Although they are flooded by the tides, they are located just upstream of the salt front, the river essentially becoming backed up as it meets resistance from high tides. Freshwater tidal marshes are characterized by salt intolerant plant species, typically a rich association of emergent grasses, sedges, rushes and forbs, with only occasional shrubs. Freshwater tidal marshes are considered a globally rare habitat, they support several rare species, and they are tracked by the Natural Heritage and Endangered Species Program as a high priority natural community.

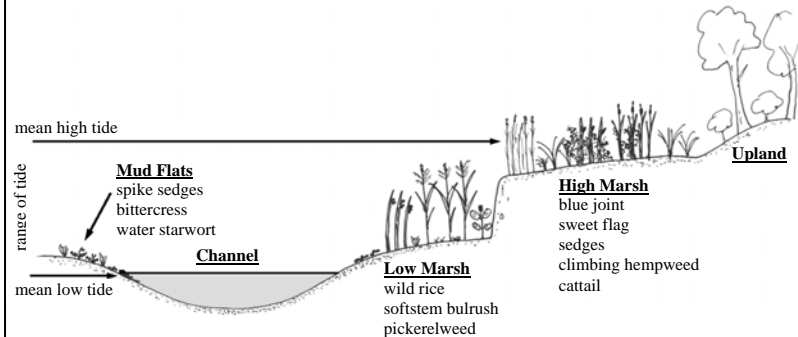
Environment: Freshwater tidal marshes occur along the dynamic shores of rivers, and hence are often structurally diverse. They may include low marsh, high marsh, mud flats, rocky shores, and the river channel. Ditches and freshwater seepages and streams may add to the complexity of the habitat. The phenomenon of the saltwater "wedge," formed by the freshwater floating on the heavier saltwater, extends the salt influence further upstream in the lower-lying areas such as mud flats, ditches and shores (brackish and freshwater environments may therefore be adjacent). Lower lying zones are also subject to more prolonged inundation. All of these habitat variations share two common features: average annual salinity is less than 0.5 parts per thousand, and the habitat is flooded (usually twice) daily. Freshwater tidal marsh represents the upstream end of a gradient, ranging from coastal salt marsh, to brackish tidal marsh, to freshwater tidal marsh. In one rare case along the North River, extensive tidal shrubland and tidal forest communities have developed in the uppermost freshwater tidal zones.

- **High marsh**, also called backmarsh, is similar in structure to the high marsh of tidal salt marshes. Backmarsh begins with an abrupt bank of peat 1-3 feet above mean low water. Backmarsh is generally more developed along lower gradient rivers (North, Agawam, Palmer Rivers), and is often the most diverse vegetated zone of the freshwater tidal marsh.
- **Low marsh** develops on the muddy or rocky sloping shores of tidal freshwater areas, the result of respective deposition or scouring. Low marsh is usually limited to small pockets in low gradient rivers, located below the bank of high marsh. Higher gradient or larger rivers (such as the Merrimack) appear to have more low marsh habitat in their freshwater tidal marshes.
- **Mud flats** are usually much more sparsely vegetated than the low marsh, supporting a different suite of low-growing plants, perhaps due to the increased disturbance from sediment deposition and more prolonged flooding.
- **Rocky shore** habitat, like the mud flats, is sparsely vegetated with low growing annuals, perhaps due to shallow soils and stronger erosive forces from the river. Rocky shore habitat is usually limited to small patches, however higher gradient or larger rivers appear to support more of this habitat type.

Freshwater Tidal Marshes

State Status: None

Federal Status: None



Cross section showing characteristic species of Freshwater Tidal Marsh, including mudflats, low and high marsh.

Characteristic Plant Species: Much of the backmarsh consists of loose associations of herbaceous plants and grasses such as blue joint (*Calamagrostis canadensis*), sedges (*Carex lacustris*, *C. stricta*), smartweeds & tearthumbs (*Polygonum punctatum*, *P. arifolium*), jewelweed (*Impatiens capensis*), arrow arum (*Peltandra virginica*) and bur-marigolds (*Bidens* spp.). A few species such as narrow-leaved cattail (*Typha angustifolia*) and sweet flag (*Acorus calamus*) occasionally forms exclusive stands, and climbing hempweed (*Mikania scandens*) often sprawls over large patches of backmarsh. Occasional shrubs include buttonbush (*Cephalanthus occidentalis*), silky dogwood (*Cornus amomum*) and swamp rose (*Rosa palustris*), which often occur in the upper edges of the backmarsh.

Low marsh typically supports stand-forming emergent plants, often with tough mat-forming rhizomes that resist erosion, although some annuals may also dominate large sections of marsh. Large stands of wild rice (*Zizania aquatica*) usually dominate the muddy areas, however stands of sweet flag (*Acorus calamus*), soft-stem bulrush (*Scirpus tabernaemontani*), arrowhead (*Sagittaria graminea*), pickerel-weed (*Pontederia cordata*) and water dock (*Rumex orbiculatus*) frequently occur in some freshwater tidal low marshes. Freshwater cord-grass (*Spartina pectinata*), three-square (*Scirpus pungens*) and water hemp (*Amaranthus cannabinus*) are typical of rockier substrates.

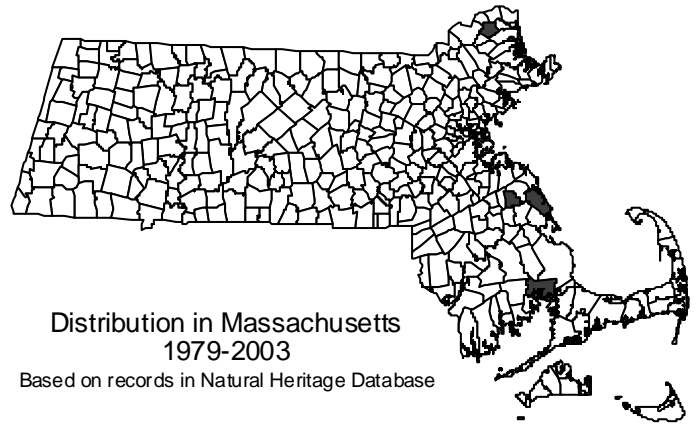
Typical species of the more sparsely vegetated mud flats include spike sedges (*Eleocharis* spp.), water purslane (*Ludwigia palustris*), water starwort (*Callitriche palustris*) and bittercress (*Cardamine* spp.).

Rocky shore habitat supports creeping spearwort (*Ranunculus flammula* var. *reptans*) and the rare plant Parker's pipewort (*Eriocaulon parkeri*).

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Pickerel Weed at Low Tide (top) and High Tide (bottom)



Characteristic Animal Species: Freshwater tidal marshes provide habitat for nesting Marsh Wren (*Cistothorus palustris*), Common Yellowthroat (*Geothlypis trichas*), Red-winged Blackbird (*Agelaius phoeniceus*), Eastern Kingbird (*Tyrannus tyrannus*), Gray Catbird (*Dumetella carolinensis*), Wood Duck (*Aix sponsa*) and Mallard (*Anas platyrhynchos*). The habitat is also used by resident Great Blue Heron (*Ardea herodias*), Green Heron (*Butorides striatus*), Osprey (*Pandion haliaetus*), and Red-shouldered Hawk (*Buteo lineatis*) nesting nearby. Wild rice is a very important food source for migrating Sora (*Porzana carolina*) and other rails, and many of the dominant plant species are important food plants for migrating and wintering American Black Duck (*Anas rubripes*). The channel may provide spawning habitat for anadromous fish such as shad or herring (*Alosa* spp.). Freshwater mussels are locally abundant along the tidal channel.

Associated Rare Species: The freshwater tidal marsh community includes many state listed rare plant species, including Parker's pipewort (*Eriocaulon parkeri*) (E), Long's bittercress (*Cardamine longii*) (E), river arrowhead (*Sagittaria subulata*) (E), estuary beggar ticks (*Bidens hyperborea* var. *colpophila*) (E) and pygmyweed (*Crassula aquatica*) (T). Most of these species are found in the lower zones of tidal mudflats or rocky shores. A large population of hemlock parsley (*Conioselinum chinense*) (SC), a species more typical of calcareous fens in the western part of the state, thrives in the back marsh along the North River. Several of these species are also considered globally rare. Inundated false pimpernel (*Lindernia dubia* var. *inundata*) also appears to be both locally and globally restricted, although it is not currently listed in Massachusetts.

Associated rare animals include the New England Siltsnail (*Cincinnati winkleyi*) (SC) and the Coastal Marsh Snail (*Littoridinops tenuipes*) (SC), which are both known to occur in drainage ditches and seepages in fresh and brackish tidal marshes.

SC = Special Concern; T = Threatened; E = Endangered

Range: Freshwater tidal marshes are uncommon natural communities in Massachusetts: they are geographically limited to short stretches of tidal rivers in coastal areas. Many rivers in Massachusetts, including the Mystic, Saugus and Charles Rivers, have lost their freshwater tidal reach from dams located below the limit of tidal influence. Two large and high quality examples of this community type occur on the North River, at the confluence of the Indian Head River and (4th) Herring Brook, and on the Merrimack River, between the Indian and Artichoke Rivers. Several small but good examples of this community type occur on the Agawam, Mashpee, Palmer, Parker, and South Rivers.

Management Considerations: Much of the damage to freshwater tidal marshes has already occurred from historic land uses, such as damming, filling and channelization. With the more recent trend of breached or intentionally deconstructed dams, the potential exists for natural restoration of additional habitat. Two current threats to this community type are hydrologic alteration from excessive water withdrawal, and invasive plant species. The extent of tidal influence in freshwater tidal wetlands, and the upstream range of the salt front, depend in part on the amount of water flowing downstream. Excessive water withdrawal, either due to large municipal wells upstream, or the cumulative impact of smaller withdrawals, could have profound impacts on the natural development of this vegetation community. The invasive purple loosestrife (*Lythrum salicaria*) is established in some systems, although it has not yet demonstrated the ability to dominate this sensitive habitat. Yellow flag (*Iris pseudacorus*), is also occasionally established as an invasive. Excessive nutrient enrichment may impact this habitat: certain areas within the tidal freshwater reach often have the highest fecal coliform counts, probably due to concentration in areas of poor tidal flushing.

Additional Reading:

Caldwell, F.A. & G.E. Crow. 1992. A floristic and vegetation analysis of a freshwater tidal marsh on the Merrimack River, West Newbury, Massachusetts. *Rhodora* 94:63-97.

Odum, W.E., T.J. Smith III, J.K. Hoover, & C.C. McIvor. 1984. The Ecology of Tidal Freshwater Marshes of the United States East Coast: A Community Profile. USFWS. FWS/OBS - 83/17. 177 pp.